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The Automobile

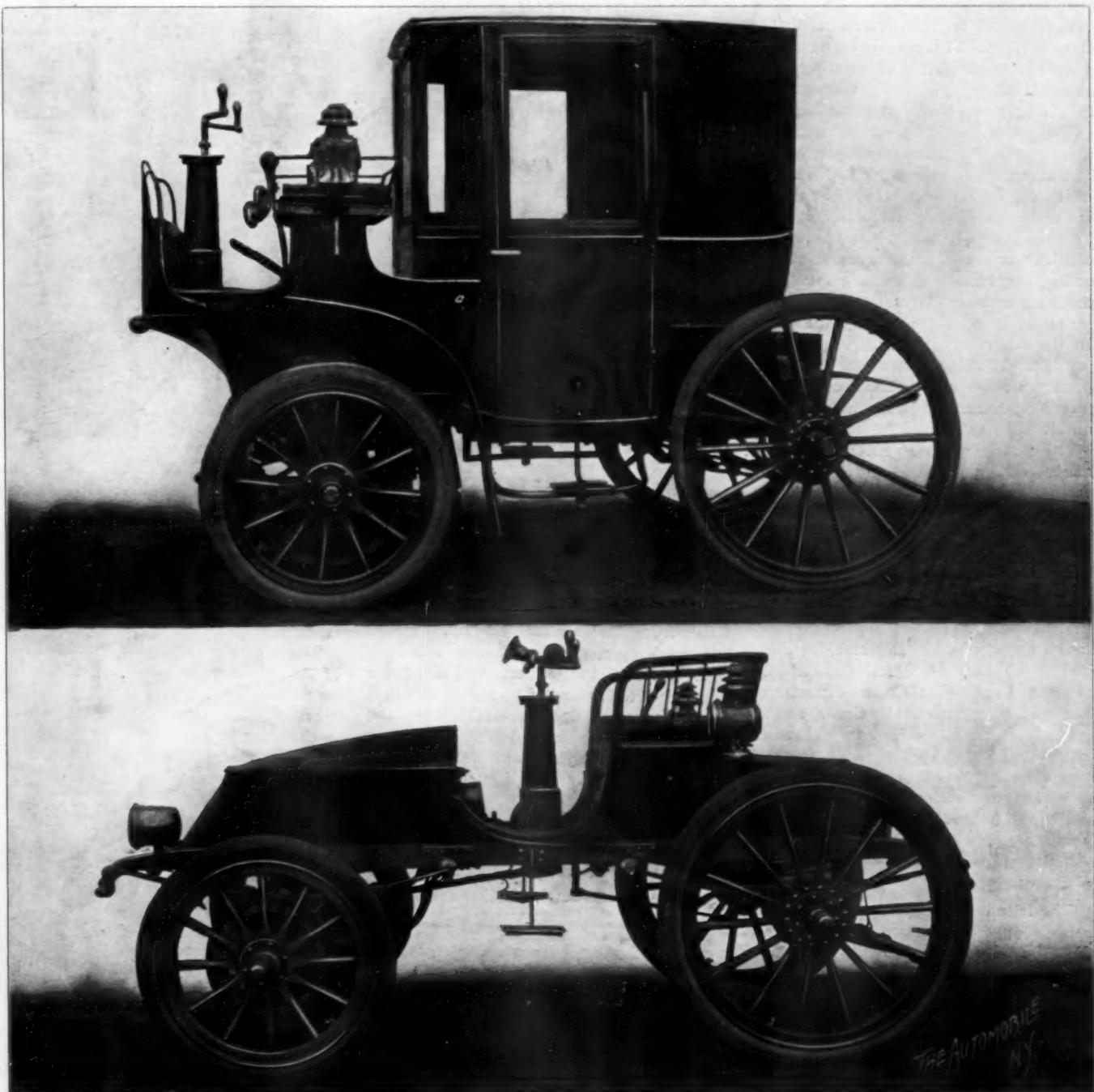
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ELECTRIC AUTOMOBILES AT THE PARIS EXPOSITION—See next page.

THE AUTOMOBILE.

Electric Automobiles at the Paris Exposition.

The exhibits of automobiles at the Paris Exposition are quite extensive, and are representative of the nations from which they come. Visitors are naturally interested in the display of French motor carriages, since they have a world-wide reputation for speed and endurance. On the front page are shown two electric automobiles in the French exhibit. The first is a novelty in that it may be changed from the coach style as shown into a victoria by removing the upper and forward part. It thus affords in the one automobile the protection of a closed carriage when desired, and all the pleasures of an open victoria.

The second is an electrolette that is novel in form. These vehicles have each a combined driving and steering front axle. In many styles this is advantageous in giving an easier riding carriage, the weight of the driving mechanism being placed over the forward driving wheels. The accumulator cells are placed in trays, which can be removed from the carriage, but the trays are larger and heavier than in American practice. The motors, of which there are two, are mounted directly on the short axles or steering spindles in the first, and are directly geared to spur gears fastened to the hub of the wheel. In the electrolette there is a spring suspension. The motors are four pole, compound wound, two series coils being placed on two of the poles and shunt coils on the other two.

The controllers give six forward speeds, one reverse speed and one braking connection.

American Exhibits.

Although not fully arranged, the exhibitors at the Paris Exposition of American automobiles will be as follows: American Electric Vehicle Co., 7; American Roller Bearing Co., 2; Cleveland Machine Screw Co., 10; Columbia & Electric Vehicle Co., 10; The Locomobile Co. of America, 9; The Overman Automobile Co., 2, and the Riker Motor Vehicle Co., 17. These exhibits are located at Vincennes, to which only a small percentage of the visitors go. Reports show that only from one to three per cent of those visiting the fair go to Vincennes.

Boston's Parks.

The friends and opponents of the automobile appeared before Mr. Chas. E. Stratton, chairman of the Board of Park Commissioners, at 64 Pemberton Sq., Boston, June 25th, to present the arguments for and against the admission of automobiles in Boston's parks. The automobile had many supporters present, and among those who discussed its side of the case were Dr. J. S. Stedman, Mr. Geo. von L. Meyer, Prof. W. S. Derry and A. H. Stedman.

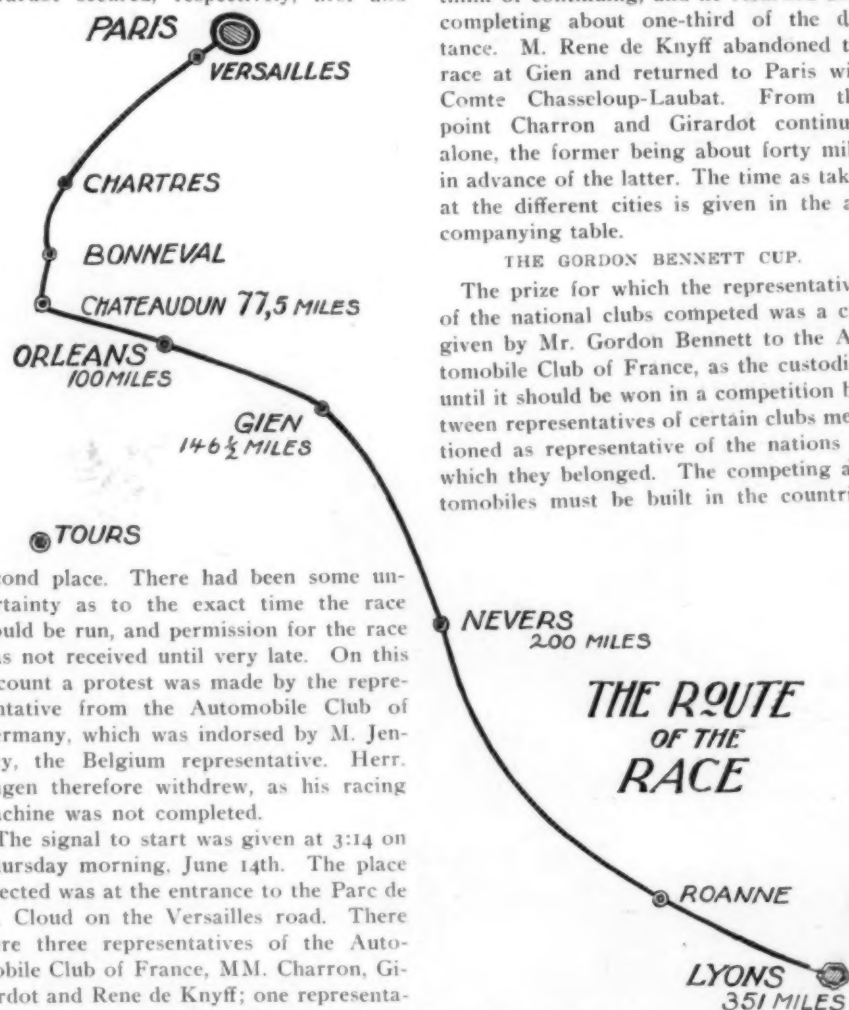
The International Race.

The great race in which the automobile world was particularly interested and in which the national clubs of the different countries were invited to participate, has been run. But two competitors reached the finish, both competing for the Automobile Club of France. MM. Charron and Girardot secured, respectively, first and

frightened horse, ran into the curb and broke a rear wheel. With the aid of a blacksmith he succeeded in making sufficient repairs to enable him to continue the race after losing an hour. Mr. Winton was not so fortunate, having steering apparatus buckled and two tires badly punctured. The damage was too great to think of continuing, and he returned after completing about one-third of the distance. M. Rene de Knyff abandoned the race at Gien and returned to Paris with Comte Chasseloup-Laubat. From this point Charron and Girardot continued alone, the former being about forty miles in advance of the latter. The time as taken at the different cities is given in the accompanying table.

THE GORDON BENNETT CUP.

The prize for which the representatives of the national clubs competed was a cup given by Mr. Gordon Bennett to the Automobile Club of France, as the custodian until it should be won in a competition between representatives of certain clubs mentioned as representative of the nations to which they belonged. The competing automobiles must be built in the countries



second place. There had been some uncertainty as to the exact time the race would be run, and permission for the race was not received until very late. On this account a protest was made by the representative from the Automobile Club of Germany, which was indorsed by M. Jenatzy, the Belgium representative. Herr. Engen therefore withdrew, as his racing machine was not completed.

The signal to start was given at 3:14 on Thursday morning, June 14th. The place selected was at the entrance to the Parc de St. Cloud on the Versailles road. There were three representatives of the Automobile Club of France, MM. Charron, Girardot and Rene de Knyff; one representative from Belgium, M. Jenatzy, and one from the Automobile Club of America, Mr. Alex. Winton. Comte de Chasseloup-Laubat acted as starter.

The race was lively from the very start, and between the first and last competitor there was scarcely a minute's difference in the time as they passed Versailles. Gi-

from which they are entered, and shall conform to the requirements of the rules of Automobile Club of France. The distance shall be not less than 341 miles, nor more than 403 miles (550 and 650 kms.). A club may be represented by one, two or three automobiles, and the cup is to go to the club, one of whose automobiles shall

Miles.	Paris.	Versailles.	Li-mours.	Chateaudun.	Orleans.	Gien.	Nevers.	Lyons.
	0.		18.5.	77.5.	100.	146.5.	200.	351.5.
Charron, France	3:14:00	3:24:00	3:52:00	5:40:55	6:10:00	7:15:00	8:42:00	12:23:49
Girardot, France	3:14:00	3:23:00	3:49:15	5:14:44	5:53:00	8:45:00	10:10:00	1:44:28
Rene de Knyff, France	3:14:00	3:24:02	3:53:30	6:49:00	Withdraw.		
Jenatzy, Belgium	3:14:00	3:23:02	4:29:00	5:51:56	8:28:00		
Winton, United States	3:14:00	3:24:02	3:59:00	6:28:50	8:30:00	Withdraw.		
Engen, Germany		Did not start.						

first, Charron third, Winton fourth, and Rene de Knyff last. Eighteen miles out Jenatzy had gone from second to fifth place, Winton keeping his position. From this point on Jenatzy drew up to second place until after passing Gien, where his automobile was disabled, bursting two tires, so that he was obliged to return.

M. Girardot in endeavoring to avoid a

first complete the run. A club securing the cup shall be ready to defend it under the same rules as those under which it obtained it. The race is to take place in the country of the club holding the cup.

The races are to be under the supervision of a committee composed of a member from each club competing, but shall include as members Mr. Gordon Bennett and a member of the Automobile Club of France. This committee is to choose a president outside of its own body.

The Lightest Automobile.

By Robert H. Thurston.*

The most important quality of the automobile, of whatever class, next to absolute safety, is a high ratio of power to weight. The problem of the automobile designer and constructor is very much like that of the builder of the torpedo boat, or in fact of any other apparatus intended for transportation, and a primary necessity is lightness combined with ample strength of parts and of the structure as a whole. But in transportation it is not only desirable that the vehicle itself, whether carriage or boat, and its propelling apparatus be light; it must also, for highest results, be economical in use of its supplies of all sorts. It must necessarily carry more or less of weight in this form; although the case is somewhat different with the automobile, which may take its supplies on board at intermediate points en route, from that of the steamship, which must carry all its needed supplies from the point of departure. Nevertheless, the same conditions do affect the automobile in an important degree, and other things equal, that which can traverse the longest route without stopping for replenishment has a decided advantage; especially as it often happens that the route to be taken is of considerable length with few, perhaps no, way-stations at which supplies of the right sort can be obtained.

A maximum ratio of strength and durability to weight and the highest possible economy in use of fuel and supplies, in combination with safety, comfort and convenience, thus constitute the characteristics of the automobile which is to, in turn, constitute the problem of the designer; while the determination of the principles involved and of the facts and data upon which the proportions of the system must be founded furnish a no less interesting and important subject of investigation for the experimenter in this department of mechanical engineering. Many facts are already well known, and the principles involved are, in general, well established.

There remains to be done a large amount of work in the study of the available materials of which to construct the parts of the machine and its carriage, and especially in the study of the best forms, proportions and types of motor suitable for the work. We will take up the simplest problem, the quality of the materials of our construction, first.

The engineer commonly looks into the tables of strength of materials, published in handbooks and special treatises on the subject, to ascertain what materials are suitable to his use for a specified construction, and gives careful attention to the figures for strength, ductility and resilience, and to the modulus of elasticity; but he rarely looks to the figures for density and weight per unit of volume. Where, however, he is to design a steam vessel, a

locomotive or an automobile, these last have supreme importance, and his first question is, or should be, what is the relation of the weight of this substance to its strength? It would, for his purposes in these departments, be of little advantage, usually, that a material should be discovered having double the strength of that with which he had formerly been compelled to content himself if, at the same time, the density of the new material should prove to be double that of the old. On the other hand, the discovery of a new available material for parts requiring union of strength with lightness, having half the density of the commonly used substance, though of no greater strength, would prove of immense value.

The true measure of the value of a material of construction in this department, as the writer has often pointed out,* is the ratio of strength to density, and is measured, in turn, by the length of a wire or rod of the material which could be supported by one end without breaking. Thus iron and mild and tool steels, respectively, of usual compositions, will support 50,000, 75,000 and 125,000 feet, from about ten to about 25 miles, of their suspended length in wire or bar; while the fine steel of the hair-spring of the watch will carry 300,000 at times, nearly 60 miles. Nearly all the available metals, in this work, gain strength with reduced section, and exactly the same iron which, in a cable-bar, supports 50,000 pounds on the square inch, will carry double that load in a No. 8 wire, hard-drawn. The hair-spring is not of as high a "temper," as the steel-maker would say; is not as hard and strong a steel, in similar sizes, as the tool-steel; yet its gain in the process of working down its minute section is thus enormous.

Hence follows another obvious deduction: For the class of metals in which this phenomenon is observed, the smaller the section of the material required in the production of a projected construction, the larger, proportionally, the ratio of load to weight, and to this degree the better the construction. We are thus to seek materials having a high self-carrying capacity, as measured by the length which they can support of their own substance, and of these materials we are to design constructions demanding, where of metal, usually, least transverse dimensions, and subjected, in the process of manufacture, to most reduction of section in the rolling mill and the wire-block. Where high steel can be used in place of low or of iron, and where a small section can be availed of in place of a larger one, there is effected a decided improvement. Machinery and carriage being made of the materials of maximum self-supporting capacity, and the motor-machine being designed in such manner as to give the lowest possible combined weight of machine and supplies

for the proposed length of route, other things equal, the builder and his client will have reason to be in maximum degree satisfied.

The next question is evidently: What are the available materials, and how are they to be assembled in such manner as to give us the lightest, strongest, most economical apparatus possible? In the study of this question, let us take the steam-automobile, one of the "locomobiles," as the French call them, as an illustration. In the design of this apparatus, we must have the best combination of strength and lightness in all its materials, proportioned in every part and piece in such manner that absolutely no material shall be wasted or superfluous weight incurred, put together in such manner that the care and skill of the designer in proportioning his parts shall not be entirely lost through inadequate union of part with part and of the several elements of the structure one with another, the whole carried on running gear of maximum needed strength, and durability and flexibility, and driven by a motor-system which shall be at once simple, strong, powerful and safe, a combination of highest possible value. The general principles involved can only be discussed in any one article, even if brevity be not demanded, and the details and the proportions must be worked out by the designer in his study and over his drawing-board, and through a tentative process likely to involve many errors only to be corrected by experience and many experiments with alternate constructions. No such construction was ever made perfect without careful thought, detailed study, intelligent construction by experts experienced in the class of work to be done, and prolonged and scientific experiment with the details and the completed construction. Even at best, and with a marketable and fairly satisfactory plan and construction, it is to be expected that every season will bring about changes and improvements for a long time to come.—Concluded in August.

The Akron Automobile Patrol.

"The electric police patrol wagon is a success," said Mr. George Wilson, its operator, to a representative of THE AUTOMOBILE a few days ago at Akron, O. "We have carried sixteen persons and have mounted a twelve per cent grade at five miles an hour. A four-mile trip with sharp turns, railroad tracks, etc., that require us to slow down, we make in twenty-five minutes, which is much quicker than we would dare to drive horses. There are some things that might be improved as, for instance, the tires are round rubber, but I think that if they were flat or broader there would be less slipping in sand especially. At present, if we get in such a place, we throw a few sticks under the rear wheels, and the machine pulls out all right." For illustration and description see THE AUTOMOBILE, Vol. II, No. 5.

*Director of Sibley College, Cornell University, and Hon. Mem. the Automobile Club of America.

**"Materials of Aeronautic Engineering," R. H. Thurston, Engineering Congress, Columbian Exhibition, Chicago, 1893.—Trans. A. S. M. E., 1893. See also "Materials of Engineering," 3 vols, 8vo; New York and London: J. Wiley & Sons.

Club News and Views.

Club Directory.

Automobile Club of America, Homer W. Hedge, Secy., 120 Broadway, New York; representative to Paris Congress, A. C. Bostwick; representative on International Racing Board, Clarence Grey Dinmore; substitute, John H. Flagler.

Automobile Club of Baltimore, W. W. Donaldson, Secy., 872 Park Ave., Baltimore.

Automobile Club of Chicago, Andrew R. Sheriff, Secy., Calumet Club, Michigan Ave., Chicago.

Automobile Club of Columbus, C. M. Chittenden, Secy., Broad St., Columbus, O.
Automobile Club of Rochester, Fredk. Sager, Secy., 66 East Ave., Rochester, N. Y.

Buffalo Automobile Club, Geo. S. Metcalf, Secy., Buffalo, N. Y.

Cleveland Automobile Club, L. H. Rogers, Secy., Cleveland, O.

Columbia College Automobile Club, Lewis Iaelin, Secy., Col. College, New York.

North Jersey Automobile Club, E. T. Bell, Jr., Secy., Paterson, N. J.

Philadelphia Automobile Club, Frank C. Lewin, Secy., Hotel Flanders, Phila., Pa.

San Francisco Automobile Club, B. L. Ryder, Secy., San Francisco, Cal.

Philadelphia Club.

The club run of June 14th, which was planned to Belmont, was cut short by the storm. Among those who assembled at Broad and Walnut Streets were the President of the club, Mr. Henry G. Morris; the Secretary and Treasurer, Mr. Frank C. Lewin; Mr. Herbert Wardin, Mr. J. Horace Harding and others.

The membership is growing rapidly, and the outlook is most promising. The office of the Secretary is 250 N. Broad Street.

The Club's New York Show.

Plans for the automobile show at Madison Square Garden the first of November, under the auspices of the Automobile Club of America, are progressing rapidly. The program for the contests and exhibitions is not yet completed. The space allowed to builders for the exhibition of automobiles is being applied for, and allotments have been made to the following companies: A. U. Automobile Co., Automobile Co. of Am., Canda Mfg. Co., Foster Automobile Co., T. H. Harris, Locomobile Co. of Am., National Automobile & Electric Co., Riker Motor Vehicle Co., Stanley Mfg. Co., and Winton Motor Carriage Co. Manufacturers of accessories have not yet been assigned space.

Club Notes.

The New York Athletic Club has very courteously extended to the members of the Automobile Club of America the privileges for the season of its house and grounds at Travers Island.

The club house at Kingsland Point, the use of which Mr. John Brisben Walker very generously gave to the Automobile Club of America, has been completely refitted and members will find everything for their comfort. The twenty-five miles from New York City makes an enjoyable run. Mr. Walter Stearns is the steward of the house.

The Columbus Automobile Club has entered the fight for a reasonable speed limit for automobiles in Columbus in earnest, and will watch other moves of horse owners to shut out the more modern method of locomotion.

The automobile business in Buffalo has been very lively since the installation of the new charging station of the New York Electric Vehicle Trans. Co., on West Utica Street. The twenty-four carriages that were in the first consignment to this station have been kept in almost constant service.

The Rochester Club has had a number of runs to the lake the past month, and in respect to the encouragement of the sport and protection of the rights on the public highways much is being done. Concessions have been secured respecting the speed of automobiles. The club summer schedule will be ready in a few days.

Mr. A. C. Bostwick, Chairman of the Racing Committee of the Automobile Club of America, has entered automobile races in France, and in the recent Bordeaux race came in third, eighteen minutes after the winner in a 200-mile race. There were nine French experts in competition, and that he excelled seven of them is a most creditable performance.

A number of prominent automobilists met at the Buffalo Club, of Buffalo, N. Y., on the evening of June 25th, to take preliminary steps for the formation of an automobile club. Mr. Andrew Langdon was temporary chairman, and Mr. George S. Metcalf, secretary. The membership committee is composed of Dr. V. M. Pierce, Dr. Truman J. Martin, J. L. Langdon, F. A. Babcock and A. Moesch. About twenty have already signed the roll.

The Philadelphia Run

The hundred mile run from New York to Philadelphia by the Automobile Club of America occurred on June 2d, as was scheduled in the last issue. There were on hand at the Waldorf-Astoria for the early morning start four electric, six gasoline and nine steam automobiles, with thirty or more passengers up. Several of

the party, however, were unable to make the trip, but came out to give those who did go a good send off. Thus a number withdrew after crossing Staten Island.

The course marked out was a pleasant one, and for the most part of the way lay over improved roads. Instead of a dignified procession in which the pleasures of the run might be enjoyed as a body, each automobile seems to have had a will of its own and followed whatever route and schedule pleased its fancy. As a result, the early arrivals at Princeton, where luncheon was to have been served, waited a long time for stragglers, and then an hour and a half later than the schedule went on. As they reached Trenton a heavy storm broke over, and while some pushed on in spite of the elements, others sought shelter. Vice-President and Dr. Chamberlin were the first to reach Philadelphia at 7:22, but soon after Percy Owen came up, and later S. T. Davis, Jr. and A. R. Shattuck. The others followed. Mr. Metz, who had been in the van nearly all the way, reached Camden first, but left his tricycle here and afterwards came back for it, and was then third at the Hotel Bellevue.

Members of the Philadelphia club had planned to run out to Merchantville to meet the New York club, but the severe storm prevented them. There were a number, however, at the ferry. The return was made by most of the automobilists on the following day, although several remained longer. The three electric carriages that participated were Riker's, and all got through safely and returned as successfully. They demonstrated that the electric automobile is capable of making tours of considerable length, and by carefully planning a trip many hundred miles could be made without inconvenience on an electric automobile.

License Necessary in Yonkers.

The department of the city of Yonkers for the inspection of boilers and examination of engineers has decided that automobiles propelled by steam come under the ordinance that requires all boilers carrying more than 15 pounds to be inspected and their operators examined. The ruling applies to all steam vehicles coming within the city limits, whether passing through or permanently maintained in Yonkers.

In regard to the examination of operators, Mr. David Chambers, the city inspector says: "It is not expected that all parties operating steam automobiles are practically engineers, but it is necessary that they have sufficient knowledge of the mechanism and management of the machine they are operating to insure the public safety." The fee for inspection is \$5, and the license fee is \$2 the first year and fifty cents for each yearly renewal thereafter. The office of the inspector is 9 Dock Street.

Here and There.

Pacing machines or motor cycles will soon be turned out at several factories of the American Bicycle Co.

Major R. P. Davidson, of the Northwestern Military Academy of Highland Park, Ill., is off on a 400-mile automobile trip.

A well-known proprietary medicine manufacturer is reported to be assembling automobiles, which he exchanges for advertising space.

For want of a wheel the race was lost. The hour taken to repair the wheel of Girardot's automobile gave Charron the international race.

The fight is still on at Columbus, O., for a reasonable speed limit for automobilists. On might as well walk as to go at six miles an hour.

The flash point, the temperature at which the oil gives off inflammable vapours. This temperature is not, however, absolute, but varies with the barometer.

An automobile race at Overland Park, Denver, last month drew a large and enthusiastic crowd. The recorded time for a mile made by a locomobile was 1:57:15.

A thirteen mile race between Harvard students took place just out of Boston the first of last month. There were five contestants, and the race proved quite spirited.

A bicycle rider on Long Island was impaled on the shaft of a dogcart recently. Such accidents will not occur when the shaftless vehicles are substituted for the above kind.

At Baltimore the parks are open to electric automobiles, but closed to steam and gasoline. This discrimination is certainly unjust considering the perfect character of these automobiles.

Although Philadelphia has a speed limit of seven miles an hour, it is said to be seldom enforced, while the ordinance requiring vehicles to keep to the right is closely followed and offenders are promptly fined \$5.

The family automobile was awarded to the wife pending a settlement in a Chicago suit for divorce recently. According to this ruling, it would seem that the automobile must be classed with the family furniture, etc.

One mile of macadamized road is to be built at Port Huron during the Good Roads meet, July 2-5, under the supervision of E. G. Harrison, the expert in road construction from the government office of Public Road Inquiries.

On the Long Island century run of June 16th, two Canda "autoquadricycles" carrying two persons each, made the run and scored with the cyclists. They started with the 6:30 bunch and came in with the same crowd, after eight hours running time.

A scheme is proposed among certain business men of Philadelphia to establish an automobile 'bus line that will bring shoppers from neighboring towns to their doors. These 'bus lines are to run from certain towns on specified days, having regular hours for starting both ways.

The first automobile exposition and tournament is to be held at Branford Driving Park, Branford, Conn., July 25 and 26. \$1,500 worth of prizes are offered. N. C. A. rules will govern the contests. Circulars can be obtained from the chairman, 268 Massachusetts Avenue, Boston.

A fare of one and one-third fare has been granted on the certificate plan by the central passenger association for the Port Huron, Mich., good roads meeting. When you reach Port Huron present your certificate to Henry E. Perry. This promises to be a well-attended convention.

A correspondent of the Autocar, London, tells of an incident in connection with the destruction by fire of the works of the Speedwell Motor Co. In a building separate from the main works was stored cans of petrol in wooden cases. The fire destroyed the cases, but the petrol was neither exploded nor burned.

The Superintendent of Parks at Albany issues permits to automobilists after they have first demonstrated that they can operate their vehicle. The rule applies equally to owners of all kinds of automobiles. So far no accident has occurred under this plan, and it seems to meet the approval of all interested.

Electricity seems to play an important part in the operation of every automobile, no matter by what power it is propelled. The electric employs its force entirely; the gasoline makes use of it for igniting the carbureted air in its cylinder, and the steam automobile makes use of electricity to start the fire under the boiler. The automobilist should therefore understand electrical apparatus.

Foreign Notes.

The Automobile Club of France has expended during the past year 364,922 francs.

The license granted to an automobilist in Paris has attached a photograph of the person to which it is issued for the purpose of identification.

There has been formed with headquarters at Heidelberg, Germany, a club called the Alldentscher Automobile Club, which is a federation of all the clubs of the empire.

Mr. A. C. Bostwick, Chairman of the Committee on Runs, etc., of the Automobile Club of America, has been elected a member of the Automobile Club of France.

Herr Vasserot, of Frankfort-on-the-Main, won the long distance race of the Rhenish Automobile Club, which was run last month. The course was from Mannheim to Pforzheim and return.

A general automobile repository has been instituted by German builders at Berlin. All makes and styles are here exhibited, together with an extensive line of accessories. It will be maintained permanently.

Count de la Valette is leaving Paris, accompanied by Gen. Gallieni, with six specially constructed automobiles for use in Madagascar. An experiment is to be made to determine whether the automobile is practical for service on the roads of this island.

Automobiles of various types are to be found on the streets of Paris for public hire. The prices are not high, as compared with such service in America. A two-seated automobile with driver can be had for \$1.40 the first hour and \$1.00 for each hour thereafter.

The annual motor bicycle race organized by Le Velo, of Paris, took place May 31st. The distance was 100 kilometres, 52 miles. The winner was A. Buquet, whose time was 2 hours 17 min. 11 sec., being 1 min. 37 sec. ahead of Bonnard, second. This speed is equal to 27½ miles per hour.

The Compagnie Routiere de France has established a daily automobile omnibus service between Paris and Fontainebleau, a distance of 45 miles. The automobile now running between these cities leaves Paris in the morning and returns, leaving Fontainebleau at three in the afternoon.

The Moto Club of France is a new organization founded by a number of automobilists who recently resigned from the Automobile Club of France. The new club is to be conducted purely in the interest of automobilism, and the social features, for which the Automobile Club of France is famous, are not to be found on the programs of this club. The club starts with one hundred members.

At the little English village of Leatherhead, during a benefit given for sufferers from the Boer war, it was found impossible to make the connections from the local electric circuits to operate the cinematoscope. The interruption to the program was, however, speedily terminated by an automobilist who ordered his electric carriage brought around where connection could be made with its storage battery.

The seven steam tractors used by Lord Roberts' army in South Africa are, according to the London Times, doing remarkable service. The seven do 5,000-ton miles of profitable work daily, which is an average for each of 35 tons 20 miles. The cost of carriage by bullock train is 35.3d. per ton mile, at which figure each engine earns £114 per day. Its working cost cannot amount to more than £14, even at war prices, so that each pays for itself and train twice each month.

NEW STYLES OF AUTOMOBILES

American Power Carriage.

The automobile shown in Fig. 1 was built by the American Power Carriage Co. of Boston. It is very light in appearance, the running gear being built of steel tubing, with wire wheels. The motive power is a Duplex gasoline motor, mounted very nearly in the center of the frame. The driving chain runs over a large sprocket on the circumference of the differential gear. The fuel tank and ignition batteries are placed in the carriage body.

The Whaley Henriette.

The automobile illustrated in Fig. 2 is the first one built in the northwest, having been completed May 5th. It was built and designed by Mr. C. F. Whaley, of the Whaley-Dwyer Co., of St. Paul, Minn. The total weight of the vehicle, including fuel and water, is 800 pounds. It is equipped with a three-horse power gasoline engine. The cut shows the general design and style of this motor carriage.

The speed can be varied from zero to twenty-five miles an hour. Other automobiles are being built by Mr. Whaley, who has taken up this work with a great deal of enthusiasm. The various parts give evidence of strength, and the general appearance is very neat.

Columbia Gasolene Runabout.

The gasolene runabout which is in almost daily use by Mr. H. P. Whitney, is shown in Fig. 3. It has a single cylinder motor, water cooled. The motor is of four-horse power, and will give a speed up to twenty miles an hour. The water pipes with webs for cooling are noticeable at the front of the carriage. For steering the hand wheel is used, as is common abroad.

The storage batteries for igniting, the gasolene tank, etc., are placed in the body of the carriage. The speed changing gears run in oil, being enclosed in a tight box. This is one of the first gasolene vehicles turned out by the Electric Vehicle Co., and while at the present time there is less than a half a dozen in use, others will be rapidly turned out, as these are tested by long service. It seats two persons and is a very serviceable vehicle. There is also room for baggage, tools, etc., at the back, and as a whole is roomy. The wheel base is long and the frame well braced, which gives an easy riding carriage. The controlling levers are at the left of the seat, so that the operator sits at that side.

Riker Electric Cab.

The cab shown is one exhibited at the Paris Exposition by the Riker Motor Vehicle Co., of Elizabethport, N. J. It weighs 4,000 pounds, is equipped with 2 three-horse-power motors and a 110-ampere-hour battery, which is capable of making 30 miles. The maximum speed is

12 miles an hour. The tires are $2\frac{1}{2}$ -inch solid rubber. At the close of the Exposition it will be used on streets of Paris.

New Haven Cab Co.'s Omnibus.

The omnibus shown in Fig. 5 has recently been shipped by the Wood's Motor Vehicle Co., of Chicago, to the New Haven Electric Cab Co., where it is now in use. It is driven by two five horse-power motors, and has a mileage of 50 miles on one charge of the storage battery. It weighs without passengers 6,600 pounds. There are four speeds, of which the maximum is 12 miles per hour. Accommodates 16 passengers within, and is novel in design and finish. When tested in Chicago, it carried 19 passengers at 10 miles per hour with an expenditure of $5\frac{1}{2}$ horse-power.

The Packard Automobile.

Something quite distinctive in the automobile line is illustrated in Fig. 6. It is a new pattern, recently perfected by the New York & Ohio Co., of Warren, O. The body is specially designed to accommodate the motor mechanism. The wheels are of the tangent spoke, bicycle type and all are 34 inches in diameter. If spare tires are kept, one will be sufficient. The wheel base is very long, and the gauge is standard wagon gauge, 4 feet $8\frac{1}{2}$ inches; that is, the machine will always track on country dirt roads. The under frame is made of seamless steel tubing, and is perfectly flexible. By using a single cross spring in front, no strain whatever is brought on the carriage frame and mechanism by inequalities in the ground. Any wheel can rise as far as necessary, independent of the others, without bringing a racking strain on the carriage.

A horizontal, single cylinder 4-cycle engine is used, having a high compression and being variable in speed. The usual objection to the single cylinder engine is on the score of vibration, but it is claimed by the company that with its system of transmission all objectionable vibration, when the carriage is running, is entirely overcome. The engine is remarkably sensitive to control. Every function takes place properly at whatever speed it may be run, an automatic governor insuring the ignition of the engine charge at exactly the proper crank angle for that speed.

The engine will develop 9-h.p. and over on the brake, and the maker has found this to be ample to maintain a high speed on bad roads. All ordinary grades can be climbed without using the special low speed hill climbing gear. The engine shaft is very short and is connected with the clutch and gear shaft of a spring transmission. This allows a slight flexibility so as to insure against binding in any of the bearings, and the spring driving gear ob-

viates almost entirely any kick from the engine being communicated to the gears and carriage.

The gasoline tank holds sufficient gasoline for a run of 100 to 150 miles, dependent upon the condition of the roads. A special cooling arrangement, of the maker's own design, is fitted. Ample radiators are provided under the foot board of the carriage and the jacket water is circulated by means of a small pump. Only four gallons of water are carried, but this is sufficient for practically continuous running. The coolers have a total surface of sixty square feet and the heat is radiated as rapidly as it is generated. The annoyance of renewing cooling water or worrying about the amount of water left in the tank is thus removed. Both gasoline and water tank are provided, with glass sight gauge.

The oiling of the important bearings is done with a single oil box of large capacity and a single lever is provided to shut off or turn on all oilers. Certainty of ample oiling is thus secured and frequent attention to this point is not required.

The electric igniting apparatus adopted is the latest improved French system; one that has given thorough satisfaction in years of use on thousands of machines. This is the jump spark, with induction coil, thus avoiding any movable electrodes inside the cylinder and practically doing away with all working parts in the entire apparatus. By a special arrangement ordinary dry batteries are used, the amount of current taken being minimum. A reserve set of batteries is provided in each carriage and there is therefore no danger of breaking down on the road through the failure of a battery or connection.

The carburetor is of the so-called float feed type, such as is used without exception by the best European manufacturers. Whatever difficulties there may have been with this type of carburetor, as ordinarily built, in using it with a variable speed engine, are claimed to have been entirely overcome so that carburation is automatic and certain at all times. It requires no adjustment or attention whatever, is unaffected by heat or cold and will use any ordinary grade of gasoline.

A gear and chain drive is used. The reverse is a slow speed giving with varied speeds of the engine from 6 to 10 miles per hour. The hill climbing gear is approximately the same speed. With this gear any hill can be climbed and the worst cases of sandy or muddy roads can be negotiated. The high or working speed gives a range of from 7 to 20 miles, or over, per hour, dependent upon the speed of the engine. The engine can be geared as required for different localities. The speed of the engine is under perfect and instantaneous control through a pedal operated by the right foot of the driver.



FIG. 1.—AMERICAN POWER CARRIAGE.



FIG. 2.—THE WHALEY HENRIETTE.



FIG. 3.—COLUMBIA GASOLENE RUNABOUT.



FIG. 4.—RIKER ELECTRIC CAB.

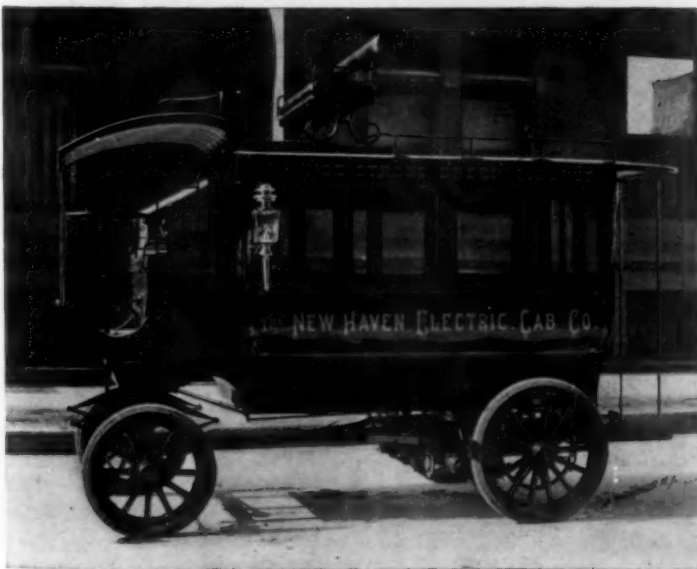


FIG. 5.—NEW HAVEN CAB CO.'S OMNIBUS.



FIG. 6.—THE PACKARD GASOLENE AUTOMOBILE.

NEW STYLES OF AUTOMOBILES.

The Automobile

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The International Race.

The great event of the year in automobile circles has taken place and France is the winner, as was generally expected. The French builders of automobiles certainly outrank those of all other nations in the construction of long distance racing machines. The Gordon Bennett cup remains with the Automobile Club of France, but whether she succeeds in keeping it as the New York Yacht Club has successfully defended the America's cup, remains to be seen. Mr. Winton, the representative of the Automobile Club of America, has had a chance to compare his racing machine with those of foreign makers, and when next he tries conclusions for this cup he will undoubtedly have an automobile in which the weaknesses of the first shall have been remedied. The heavy strains placed on an automobile traveling at the express tram speeds of these racers, is shown by the fact that but two reached the finish, and both of these having met with serious accidents. Even the improved roads of France does not prevent the breaking of axles and the crippling of wheels and tires.

The Speeds of the Race.

One of the French papers in commenting on this race compares the time made by Charron, between Paris and Lyons, with that made by the Paris-Lyons express. This train makes the distance of 318 miles in 8 hours and 53 minutes, or an average of 35.77 + miles an hour, while Charron's speed of 38.34 miles an hour would cover this distance in 8 hours and 17 minutes. This chauffeur has thus beaten the express by more than half an hour. He estimates his speed during portions of his race at 62 miles an hour, or more than a mile a minute. It was probably the variation of his speed as the character of the road changed that helped to bring him through. Girardot and Jenatzy both started out with greater speed than Charron and gained a considerable distance over him in the first half of the run, but both met with accidents, Jenatzy irreparable, and Girardot losing an hour. For the first 20 miles Mr. Winton kept well in the bunch, but the buckled rim and punctured tires—the result of a too sharp turn—compelled him to withdraw.

State Laws Needed.

An effort should be made to prepare a bill to be presented at the next session of the legislature of every state specifying the rights and privileges of automobiles and their operators, and placing their inspection and examination under state supervision. The inconvenience and expense resulting from the present custom of each town making its own rules regarding automobiles will in a short time result in limiting the district in which one may use his automobile to the place in which he resides. The owner of a steam automobile pays three dollars for his license in

New York, he rides up the river to the city limits and goes into Yonkers, where he must pay five dollars more for the inspection of his automobile and two for his license in Yonkers. The total so far is ten dollars, and by the time he reaches Albany there would be little left of a hundred dollar bill if each town followed this plan. Such methods will, of course, prohibit touring and take away one of the greatest pleasures of the automobilist. A state law that would place this matter under state supervision or provide that a license granted in one town shall be honored in another, is greatly needed.

Automobile Racing Road.

To use the public highway for automobile racing is unsatisfactory in many ways. If a course is selected and permission is secured for its use the public is deprived of the road during the continuance of the race. There are few roads that are not crossed at frequent intervals by intersecting highways from which a team may intercept a race with perhaps unlooked-for results. The automobilist competing on a public highway is never free from the uncertainty of the farm wagon or carriage appearing suddenly before him. It is possible, and the time will probably come, when we shall see a course laid out for automobilists exclusively, which will afford perfect conditions for racing, suitable roadbed, long turns, uninterrupted possession, etc. This subject is now being discussed in Great Britain, where eight and twelve miles an hour are the legal limits. In America conditions are much better, and it needs but the co-operation of the automobilists to secure such a road.

Tests of Heavy Automobiles.

For several years the Liverpool Self-propelled Traffic Association has conducted trials of motor vehicles for heavy traffic. The reports of this association have proved very valuable to builders and users of such classes of automobiles. The judges for the next trials that are to take place next year are Messrs. Calthrop, Cottrell, Hele-Shaw, Redwood, Salomons and West, names well-known in the engineering profession. The main points to be considered are cost, economy of working, various details in its operation, adhesion on greasy surfaces when light and when loaded, noise, smell, dust, etc., brakes, speed, ability to travel without attention otherwise than the movement of operating devices, ratio of tare to weight carried, ratio of platform area to moving area in any horizontal plane, efficiency of different parts, quality of workmanship and special details relative to the motive power used, whether steam, oil or electricity. Such vehicles as may be entered shall be registered as early as the last day of May, and shall conform to the requirements of the highways acts and come under one of three classes: To carry a load of one and a half tons at a speed of eight miles an

hour, to carry a load of five tons with a maximum tare of three tons at a speed of five miles an hour, or to carry a minimum load of five tons, tare unlimited, at a speed of five miles. The type of automobile that has the best record at the conclusion of the trial will probably be adopted for conveying merchandise from Liverpool to surrounding towns.

An Age of Motor Vehicles.

It is not that motors have simply displaced the horse, but the age has outgrown him. A method, a system or a process becomes out of date as it is found inadequate for the demands of the times, and man's ingenuity is able to provide that which is superior for accomplishing the desired end. The motor street car provides a method of transportation so far superior to what preceded that it is beyond comparison. There are at present 10,000 street car horses in the Borough of Manhattan. If 50,000 horses were used, the present system would be unapproached. The horse car is out of date. For the transportation of freight across the open country the automobile tractor and train has been found so far in advance of older methods that mule and bullock outfits will be found only in exceedingly rough localities. The motor wagon for light parcel delivery, the haulage of heavy freight or passenger omnibus is fast coming into use.

The Persecution of Conservatism.

Last month a child was run over on one of the streets of an eastern city. It was at first reported that the vehicle was an automobile, and the people were in favor of mobbing the owner. Later, when it was proven that the vehicle was drawn by a horse, the opinions regarding the driver were completely reversed. The accident seemed then scarcely worthy of notice. This incident illustrates a conservatism that seems by no means uncommon among the American people. This is not a conservatism that simply withholds its support, but a conservatism that persecutes the novelty because it is new. It was this same conservatism that took up all the road and made the bicyclist ride in the ditch, that excludes the automobile from our parks, that causes the automobilist to take out a license in every town through which he rides and carry a placard on his machine that every one may read his pedigree as he rides by. The automobile is new; it must, therefore, be opposed.

Automobiles and Insurance.

The insurance companies in several of the large cities are considering the automobile as an extra risk to the buildings where it is kept. Gasolene has always been looked upon with suspicion by insurance men, and on wheels it is a combination that has not been placed in the classification of risks. It is viewed with about the suspicion that electric lights

were some ten years ago. Rules formulated by associations, imposed by municipal governments and laid down by these companies help to produce a uniformly higher standard of equipment and ultimately a satisfactory adjustment of rates. Other countries, where the automobile is more generally used, have laid down laws for the keeping of combustible fluids and other hazards in connection with automobiles. These questions must receive similar attention in this country, and automobile clubs and automobilists as individuals should see that their rights are respected, and that the laws and rules shall treat justly their interests.

Accommodations for Automobiles.

A number of plans in architects' offices for future residences include accommodations for automobiles. A large apartment house planned for the upper part of New York city will have separate quarters for eight vehicles and conveniences for their care. These indicate a change that will become general in the plans of future buildings. So accustomed have we become to the stables located at a distance from the dwelling, so placed for sanitary reasons, that it may seem strange to see a carriage roll out from some part of a residence. There is no reasonable objection to the location of automobile quarters in a part of private or apartment houses, while there are a number of reasons for having it there. Those who plan houses have a new problem to consider, and tenants will soon demand of the landlord this feature in the appointments of a modern dwelling.

A Plank for Good Roads.

In the Republican platform just completed at Philadelphia among the civil service, rural free delivery, expansion and gold standard planks is placed a plank for good roads as follows:

"Public movements looking to a permanent improvement of the roads and highways of the country meet with our cordial approval, and we recommend this subject to the earnest consideration of the people and of the legislatures of the several States."

This indicates a further advance of the good roads cause and a step toward the national highway. It is safe to say that the Democratic platform will also contain a good roads plank. The forces working for improved highways are stronger than ever, and if this cause can be made a feature of this campaign it can be carried into every country and town and made to react upon our representatives in congress and in the legislatures of the States. Automobilists as individuals and clubs should seek to further the cause and to secure the performance of the pledges made in the present campaign. It is of vital importance to the automobile industry that our public roads be improved and a systematic method of extending and repairing them be entered upon. The work

of the L. A. W. has produced many miles of good highway as well as of cycle paths, and much credit is due to this organization for the above mentioned plank.

Comparison of Prices.

The idea is frequently met with that, an automobile is but a new style of bicycle that sells for three times what it will in a year or two. Those who have this mistaken conception never stop to consider the prices of carriages that are now on the market and have been for time beyond memory. It would be foolish to build an automobile of anything but high-grade materials, so that first-class carriages are not above comparison with that part of an automobile. Pneumatic runabouts sell from \$150 to \$450; pneumatic stanhopes, \$350 and \$400; spider, \$300 to \$750; a break from \$400 to \$1,400; broughams, etc., at higher figures. Where there is added to these the price of one or a pair of horses, the advantage is certainly on the side of the automobile. When the cost of the carriage is taken as a basis for comparison with that of the automobile, it is but a small part of the completed machine. The motive power is the much greater part of the expense, at least two to one. The automobile has all the advantages of the bicycle in every stage of its manufacture. Automatic machinery and economical processes are now used in the construction of the motor vehicle.

Fast Riding in France.

The rumor that automobile racing in France was to be prohibited appears now to be unfounded, since the Bordeaux-Perigueux race of two hundred miles, and the Gordon Bennett cup race of three hundred and fifty miles, have been run the past month. The fight against fast driving on city streets still goes on, and frequent arrests are made, although not as numerous as some weeks ago. This crusade has undoubtedly been necessary. The high speeds, that the new French automobiles are capable of, equal almost to that of an express train, are too great for city or town.

Automobile Omnibus in Chicago.

The substitution of modern conveyances for the antiquated affairs that attempt to serve a portion of Chicago's population with transportation via Rush Street bridge, is being considered. Last month a trial was made over this route by an electric omnibus, recently built by the Woods company. It was also run out Michigan Avenue on the South Side.

This 'bus weighs 6,600 pounds; is equipped with two 5-HP. motors and storage battery. It will accommodate twenty-two passengers, and will run up to ten miles an hour. Among the passengers on this first trip were President O'Brien, of the Chicago Carriage Co.; President C. E. Woods, of Woods Motor Vehicle Co., and a number of newspaper men.

Good Roads.

Good Roads at Elmira.

On June 15th last a good roads meeting of the N. Y. State L. A. W. was held at Elmira. Mayor Flood gave an address of welcome, to which Chief Consul Milo M. Belding, Jr., responded. Good roads in general, New York to Buffalo road in particular, and many questions in connection therewith, were discussed. A lecture was delivered by H. B. Fullerton, and an address by State Engineer Edward A. Bond.

Brooklyn Meeting.

The Good Roads Association of Brooklyn held its semi-annual meeting and good roads festival at Schwalbach Academy, Monday, June 11th. The hall was decorated for the occasion. Col. James A. Bell, President of the Association, presided. The program consisted of music, refreshments, dancing and speeches by Col. Ray Stone, of the Government Bureau of Good Roads, and H. B. Fullerton, of the N. Y. State L. A. W. The views that accompanied Mr. Fullerton's lecture were especially well appreciated.

Two Plans for Good Roads.

By Gen. Roy Stone.

Two plans have occurred to me as hopeful in the course of many years' study of the subject. Either of these means a broader scheme of national action than we have been wont to consider appropriate, but in these days we are expanding in more ways than one. We are even building roads and building them without let or hindrance or criticism, for all our new peoples, and we may some day do something of the kind for our own Americans. The first plan, which I will only indicate, is to use the postal savings. Every civilized nation but ours and some of the half civilized give their people the benefit of government savings banks. We refuse it to ours ostensibly because we cannot find a proper investment for their money, but really because the private banking interests of the country stand in watchful opposition to the measure. When this opposition can be overcome, postal savings banks can be established to the great advantage of the rural districts and the general welfare and the money can be invested in country road bonds, guaranteed by the State, these bonds bearing a rate of interest so low that it can be generally paid out of existing road taxation and running so far into the future that their final payment will not be a matter of serious concern. Whoever will take the trouble to work this out in figures will find that good roads can be built almost everywhere and without delay and with no increase of taxation and no cost to the

government. Estimating the deposits of the United States postal savings on the basis of those in Great Britain we should have enough to build a million miles of stone or gravel road in ten years. With proper limitations and supervision by State and Federal inspectors good work could be secured and the investment would be a peculiarly safe one, since every dollar invested by a county in good roads adds at least \$5 to the value of property in the county and thus multiplies its own security.

The second plan is based on the experience of our own country in building railroads. We have built half of the railway mileage of the world without taxation except in rare instances and have spent in doing so three times as much money as is needed now to make good wagon roads for the whole country. How have we raised this vast amount? Mainly by anticipating the benefits of the railroads, borrowing the money to build them and letting them pay for themselves out of their earnings or pay such a rate of interest on the money borrowed as will content its owners to let it remain on long loans or in perpetuity. The benefits of improved highways do not show in earnings since their use is free, but they appear quite as plainly in the enhanced value of adjacent and neighboring lands, and if this class of benefits can be anticipated and made available to procure the means of road building we shall be able to build roads as easily as we have built railroads.—Abstract from Brooklyn Speech.

The Automobile and Road Surface.

By E. A. Sperry.

The automobile under street car conditions brings forward an interesting field of inquiry. The single fact that the stupendous cost of permanent way and its maintenance is at once eliminated, makes the problem of more than ordinary importance. The interest and income on these two items would yield so large a sum as easily to offset much extra expense of operation, and especially expense attending the development and smoothing out of the early workings, and covering the expense of adjusting a system of this magnitude to new conditions. Such a system would, however, be subject to certain limitations, chief among which will be found decreased weight per passenger, difficulty of easily directing the excessively heavy structure, large increase in power per passenger carried, increased rolling friction factor, and, one of the most important, the limitation as to roadbed, soft tires being precluded by the excessive tonnage. Considering these factors separately and collectively, the point is at once reached, showing conclusively that

with anything like wheel pressure equal to that now obtaining in street railway service, nothing but steel pavement could be practically employed. To demonstrate this matter tests were made as follows: Asphalt roadbed was taken as the standard roadbed of the future. A piece of very hard asphaltum, laid in the most approved manner, and in constant use for two years, was selected. This had been maintained at an average temperature of 38 degrees for eighteen hours (no sun), the highest temperature during this time being 46 degrees at time of test. A 62-inch wheel with three and one-half-inch steel tire was loaded to 5,000 pounds on scale. This wheel was taken over various parts of the hard asphaltum, with the following results: Once over average depression, .029 inch; twice over, average depression, .047 inch. These depths were taken by a micrometer depth gauge easily reading to one-fifth of a thousandth of an inch, and some 30 readings were taken in each instance. It will be noticed that this depression is somewhat over one and one-half thirty-seconds of an inch. The amount of this depression is surprising, considering the comparatively light load, broad tire, large wheel, extremely firm condition of the roadbed, and the temperature at which the asphaltum was tested, and seems to bear out the statement that the real limitations are probably more those of roadbed than of any other one factor.—Abstract from recent paper.

Chicago-Lockport Boulevard.

The associated cycling clubs of Chicago, automobilists and horsemen of Chicago, are endeavoring to secure the boulevard along the drainage canal from Chicago to Lockport. The petition submitted to the trustees of the drainage district has been referred to Attorney Gilbert, who, in his opinion, said: "The power to construct such a roadway as the one described in the petition has not been expressly granted to the district, nor is such power necessarily or fairly implied, or incident to the express powers, and it is not claimed that the construction of the roadway is indispensable to the accomplishment of the purposes of the district."

Some of the trustees, however, think that such a road is necessary, and Trustee Jones introduced an order directing the construction of a macadam road thirty feet wide, and instructing the engineer to prepare plans and estimates at once. This proposition to override the opinion of the attorney was defeated by a vote of 4 to 3. After a long discussion, during which a majority of the board expressed themselves as being in favor of the roadway, the matter was referred to General Counsel Runnells for an opinion as to whether the board could construct the driveway after a formal declaration in regular session that it was necessary for the corporate needs of the sanitary district.

The Gasoline Vehicle Engine—1.

By E. W. Roberts, M. E.

The series of which this article is the introductory one, is intended to show the reader in the simplest language possible just what are the essential features in the design of gasoline engines suited to the operation of vehicles of various kinds. The writer will also make it a point to show the principal difficulties to be encountered, and also how these difficulties may be overcome. It is not the writer's intention to waste any words on descriptions of existing vehicle engines, although, of course, an occasional reference to the methods in use will be necessary.

In order that the reader who has no previous knowledge of the gas engine may be able to follow the text of these articles without serious difficulty, a brief description will be given of the principles upon which these engines operate. For use with an automobile, there are available two kinds of gas engines, one in which an impulse is given to the piston of each cylinder once in two revolutions, and the other in which an impulse is given to the piston at every revolution of the crank shaft. The first method is that employed by what is known as the four-cycle engine,

and the other by the two-cycle engine. The four-cycle engine is so named because the complete series of operations called the cycle consists of four parts, requiring four strokes of the piston for its completion. Properly speaking, it should be called a four-part cycle. The series of operations taking place in the two-cycle engine is divided between two strokes of the engine, and like the other, would be more correctly called a two-part cycle.

The series of operations taking place in the four-cycle engine is illustrated by the diagrams in Fig. 1. In these diagrams no attempt is made to show anything else but the working principle of the engine. Similar parts in the separate sketches are indicated by the same letters in order to avoid confusion. The operation of the engine is as follows: At the beginning of the cycle the piston P makes the forward stroke in the direction of the crank-shaft C, as indicated by the arrow, and draws in a charge of air mixed with fuel through the valve S, which is operated either from the cam-shaft L or by a suction of the piston. At the end of the forward stroke the valve S is closed and the mixture is compressed into a space equal to about one-quarter to one-third of the total cylinder volume when the piston is at the end of its

outward stroke. Just before the piston reaches the end of the compression stroke a spark is produced between the terminals of the igniter points at I, and the charge of fuel and air is ignited, causing the sudden rise of pressure, from which the power to drive the engine is derived. On the next forward stroke the products of combustion are expanded, and just before the end of the stroke is reached the exhaust valve E is opened by means of the cam X, allowing the products of combustion to escape through the exhaust pipe E to the atmosphere. Upon the next stroke of the piston the exhaust gases are driven from the cylinder through the open exhaust valve E, only such a portion of the burnt gases remaining as will fill the space at the end of the cylinder when the piston is at the end of its inward stroke.

In diagram A, the piston is on its first outward stroke, and the inlet valve S is open. Diagram B shows the first inward stroke, during which compression is taking place, and valves S and E are both closed. In diagram C the piston is on its second outward stroke expanding the products of combustion; valves E and S are still closed. In diagram D the piston is on its second inward stroke, and valve E is open.

For the reason that it requires two revolutions of the crank-shaft to complete the series of operations in the four-cycle engine, the cam-shaft L, from which the valves are operated, must make one revolution to two of the crank-shaft. This is usually accomplished by gears of either the spur-gear type, as shown in the diagrams, or by bevel or by helical gears. The igniting device is also operated from the cam-shaft. The diagrams do not show any method of cooling the cylinder or the valve boxes, as this will be made the subject of a discussion in a later article.

THE TWO-CYCLE ENGINE.

The operation of the two-cycle engine is illustrated in the diagram shown in Fig. 2. In diagram A the piston is shown on its upward stroke, and drawing a charge of fuel and air through the valve S into an enclosed crank chamber, which is so constructed as to be air tight. At the completion of this inward stroke the valve S is closed by its spring, and the charge is compressed on the downward stroke of the piston to a pressure of about five pounds to the square inch. Just before the piston reaches the bottom of its stroke it passes the annular port G, which is connected by a passage with the crank chamber. When the port G is opened the compressed charge rushes into the cylinder as illustrated by the arrows in diagram B, and striking the deflecting plate R on the piston it rushes to the top of the cylinder. Any products of combustion remaining from a previous charge are driven from the cylinder through the exhaust board E. On the next up-stroke of the piston the fresh mixture is compressed, is exploded just before the end of the stroke, as in the four-cycle engine, and expands

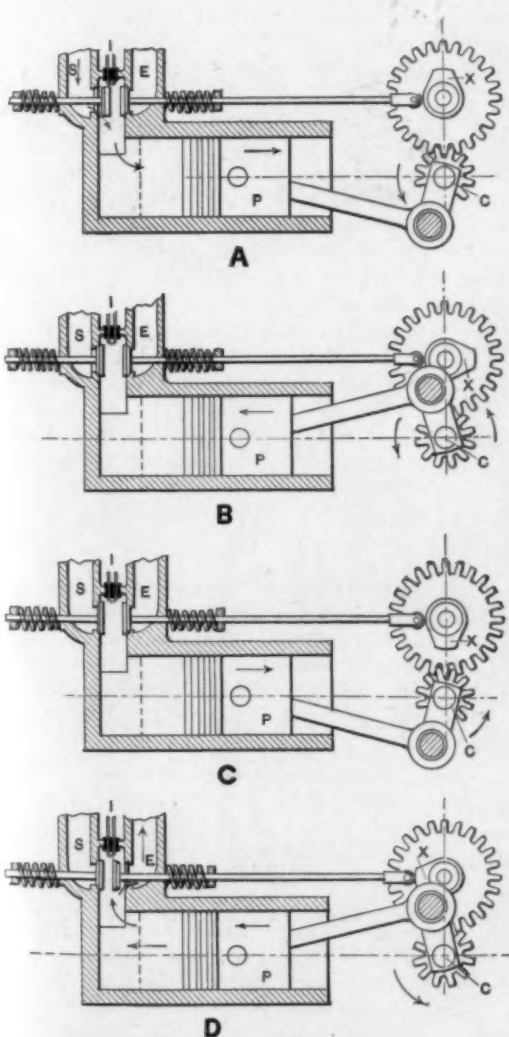


FIG. 1.

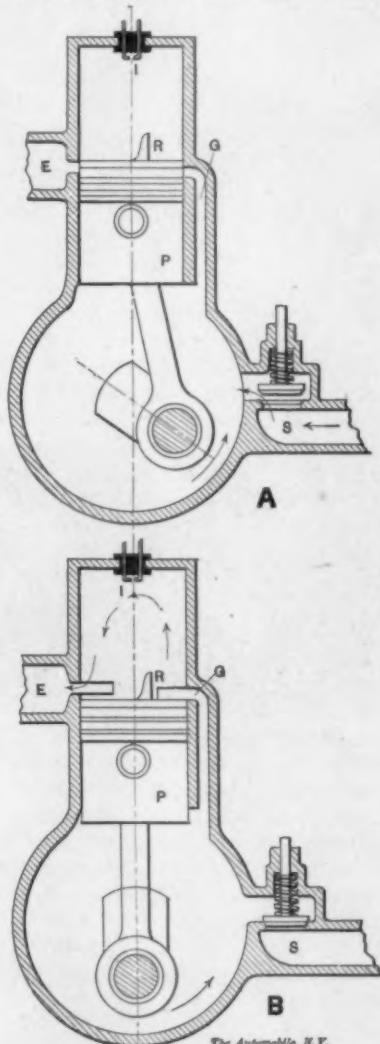


FIG. 2.

The Automobile, N. Y.

until the exhaust port E is opened by being passed by the end of the piston. In the meantime a fresh charge has been drawn into the crank case and compressed, and rushes into the cylinder through the port G, as already described.

It will be seen by the above description that this is practically a condensation of the four-cycle series into two strokes of the piston by means of a pump, the functions performed by the suction and exhaust strokes in the four-cycle engine being performed by the aid of the pump during a portion of the expansion stroke.

The Operation of Heavy Steam Vehicles.

By Arthur Herschmann.

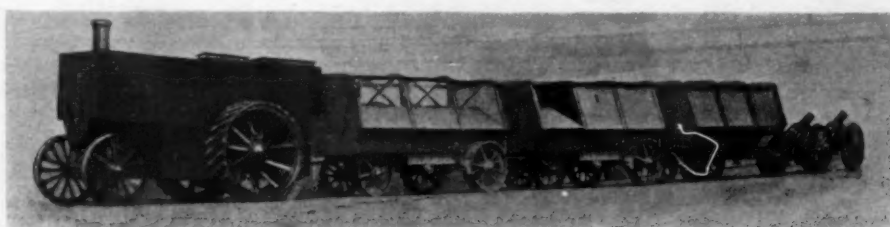
The firing of a wagon boiler can be most easily effected by means of an oil burner, and with a steam governed burner the firing will automatically respond to the requirements. However, in addition to the inherent disadvantages of using oil, it is difficult to maintain the burner in good trim during all kinds of weather, and at this stage of perfection oil burners will "roar," and occasionally give trouble and make smoke. For the latter reasons coal and coke are preferable, being besides, cheaper in use. Solid fuel can be conveniently stored away around the boiler, which latter is generally fixed in front of the wagon, and if thus located the stored fuel acts as a compressible safeguard to the boiler in case of a head collision. In using a shell boiler it is found convenient to fire through the boiler top, a system originally introduced into steam wagon practice with the De Dion boiler.

The difficulties with which one has to contend in the use of steam wagons are that they will occasionally show a little steam, and during a sharp frost it will be found difficult to prevent a pipe from

venting shower bath due to leaky pipes and the difficulties in running a condenser. It can be well said that difficulties in connection with smoke have already been overcome.

COMPOUND ENGINES.

The engine so far used is in almost every case a compound. If of vertical design it can be located under the driver's



ARMORED AUTOMOBILE TRAIN.

seat; while if of horizontal type it can be suspended from the body. In all cases a light and well designed quick revolution engine will answer the purpose if it is fitted with a reversing gear and means to admit high pressure steam to a low-pressure cylinder. The cylinder ratio should be larger than with stationary practice, seeing that the pressure used is higher, and that a large, low pressure cylinder means a powerful starting moment under live steam, and especial care has to be taken to connect the engine to the frame in an efficient manner. A flywheel is sometimes fitted and then used as a brake wheel, but I deem it unnecessary.

Generally it can be observed that most of the wagons constructed are by far too light to stand the severe strain of their work. The cost of actual propulsion per gross ton is by no means as important an item as, for instance, in an electric vehicle, and one can, therefore, well afford to provide amply for a durable construction. A heavy wagon is just as easy to bring to a

small arms as easily as the railroad train. Two such trains have recently been constructed by John Fowler & Co., of Leeds, England, who have previously built 35 unarmored trains that are now in service in South Africa.

Tests of these two trains, one of which is illustrated herewith, have been made by the British war department. Loaded, they

mounted grades as high as one in eleven without difficulty. They were also able to start on such a grade. The turning and stopping powers proved also satisfactory. When two such trains travel in company there is almost nothing unsurmountable in the way of grades, ravines and water-courses. The steel cables and anchors enable them to mount alone many difficult places, and the matter of hauling one wagon at a time over such places is comparatively easy.

The armor, which is bullet-proof, does not interfere with the movement of the train although adding to its weight. The speed is from two to six miles an hour, and the wagons are suitable for conveying troops, supplies or guns. The steam pressure is 180 pounds normal, and power is transmitted to rear axle through a system of gears. A differential gear is used on the main axle.

The water tanks carry sufficient for eighteen miles. The lookout holes for the drivers are provided with a special shutter. The driving wheels are seven feet in diameter by twenty-four inch tire. The engine is mounted on springs. The plans of the train were made under the supervision of the government engineers.

The Bordeaux-Perigueux Race.

One of the several important events in France during the past month was the race from Bordeaux to Perigueux and return, a total run of about two hundred

BORDEAUX-PERIGUEUX-BORDEAUX RACE. Times of Two-passenger Voitures.

Name.	71.02.	Miles 125 1/4.	197 1/4.
1. Levegh	1:24:35	2:40:10	4:01:45
2. Giraud	1:27:11	2:45:25	4:12:36
3. Bostwick	1:31:43	2:48:23	4:20:06
4. Farman	1:42:05	3:02:02	4:44:07
5. Secrestat	1:57:50	3:25:44	5:23:34
6. Barrow	1:44:36	4:24:18	5:36:54
7. Maurel	2:10:20	4:12:00	6:22:22
8. Champrobert	3:06:36	5:24:47	6:31:23
9. Verseln	3:19:52	3:19:03	6:38:52
Winner in Voiturette Class.			
	71.02.	80.28.	161.2.
Thery	2:03:22	2:36:00	4:40:17
Winner in Tricycle Class.			
Cormier	1:47:49	2:39:00	4:26:39
Winner in Quadricycle (2 Passenger) Class.			
Lafargue	2:45:46	2:59:00	5:44:46

*For four passengers.



STEAM DRAYS. THORNYCROFT WORKS, ENGLAND.

being frozen up. "Blowing off" will be found annoying, but this nuisance is largely caused by neglect of the driver and is suppressible.

However, these are difficulties which will be overcome in time; using a condenser there will be practically no visible exhaust in all weathers.

Condensers, however, are by no means desirable constituents of a motor wagon, and I should rather put up with an occasional cloud of steam than with a perma-

standstill as a light wagon—in fact, easier—since it may be fitted with quicker acting brakes, which, on account of their severe action, could not be fitted to a lighter construction.—Abstract from paper read before the Am. Soc. of Mech. Engrs.

Armored Automobile Trains.

The wars of the present year have shown the great value of mechanical traction for the transportation of soldiers and goods. They can be protected against

miles. There were fifty competitors in the various classes. The result is remarkable for the tremendous speed maintained throughout the run of fifty miles an hour. The race is also interesting to Americans from the fact that Mr. A. C. Boswick, a well-known member of the Automobile Club of America, competed and obtained third place, as shown in the table herewith.

The competitors entered under the classes designated, and were started at intervals of three minutes. Forty arrived at Perigueux, and more than one-half of those who entered completed the distance without a mishap.

Report of Hill Climbing Contest.

Among the important contests in the thousand-mile tour of the Automobile Club of Great Britain were the hill climbing trials. In one of these, Bunney Hill, near Nottingham, forty-eight vehicles competed. Their records were carefully kept, and we have received the following classification, which certainly speaks well for the only American automobile that participated:

- 1st. Very good, The "Locomobile" Co. of America's steam carriage, two passengers.
- 2d. Nicely, 6-HP. Panhard.
- 3d. Steadily, 5-HP. Marshall.
- 4th. Well, 21 Vehicles.
- 5th. Easily, 8-HP. Lanchester.
- 6th. Tacked up, 2 Vehicles.
- 7th. Shed passengers to ease or help push, 12 Vehicles.
- 8th. Stuck, 7 Vehicles.
- 9th. Shed passengers and stuck, 3½-HP. Decauville.

COLOR AND EQUINE TEMPER.

The following table, compiled in the early days of bicycling, gives the order of restiveness of different horses met upon country roads:

Full black.....	Never shy.
Black with white blaze...	Seldom shy.
Bay.....	May or may not.
Grey.....	Almost always.
Chestnut.....	Always.

A list of military horses was drawn up by an officer some little time ago with the same idea and conforms fairly well with the above. Unfortunately the behavior of the white horse, on beholding an auburn-haired girl, is not considered in the foregoing table.—Exchange.

An American recently returned from a trip abroad comments on the foreign design of automobiles. In nearly all a horizontal line that indicates the joining of the body and running gear is noticeable, which gives them an appearance of a platform on which is a seat and a bonnet forward that covers the motor. It reminds him of street car or railway coach construction. For neat, trim-looking automobiles, he believes America is far in the lead.

Correspondence.

Space will be given on this page to letters concerning the Automobile, its operation or construction, to accounts of tours or runs, routes of travel, good roads, etc. Discussion of subjects concerning the automobile is solicited. When requested by correspondents their names will not be published, but must always be given in the communication to the Editor.

THE FIRST AMERICAN BUILDER.

Boston, Mass., June 26.

Editor THE AUTOMOBILE:

Dear Sir: Have you the information as to who built the first gasoline automobile in this country? I know that imported gasoline motor carriages appeared quite early and that some of these carriages were reconstructed in this country. These I should not consider American automobiles. Any information will be greatly appreciated.

Yours truly,

U. S. B.

SIDE SLIPS.

Buffalo, N. Y., June 22.

Editor THE AUTOMOBILE:

Dear Sir: In a recent issue of your journal I noticed a statement concerning the danger of side slip with motor bicycles on which the motor is mounted above the wheels, as in several foreign types now on the market. How is it about the American motor bicycles having the motor mounted between the wheels? Can any of your readers give me any of their experiences with motor bicycles? I have ridden the bicycles a good many years, and for my own pleasure at the present time believe in the "two wheeler." Perhaps when we have highways as good as our cycle paths, I will then join the rapidly increasing number of four wheelers.

Sincerely,

SAMUEL L. K.

SMALL WHEELS.

Philadelphia, June 20.

Editor THE AUTOMOBILE:

Dear Sir: Are all the motor carriages of the day fitted with small wheels. If this is so, I wish to ask the readers of the "AUTOMOBILE" the reason for this construction. I wish to know what advantages are to be found in reducing the size. I have always supposed that the larger the wheels the more easily the load would be carried. I notice another feature of motor carriage construction, or rather I should say operation, which I do not understand. This is the strongly marked tendency to pitch. An ordinary buggy is much more steady going over the same road at the same speed than many of these self-propelled carriages.

A motor carriage cannot be successful if it does not ride easily. Easy riding is as prime a necessity for such vehicles as for those propelled by horses. The pneumatic tire has done away with the jolting or jar, but in some way the irregularity of the street surface or of the road appears not to be taken into account. Motor carriage

builders will have to learn the same lesson as the ordinary carriage builder, which is that a man owning one does not wish to be confined to good roads only. There are many times when it is desirable to pass over roads which are anything but good. One often wishes to explore an unknown section, or it may be that when out upon a trip circumstances prevent the use of good roads and by-ways must be traversed. Often times one must of necessity, if he goes out at all, go over roads in bad condition. But when one is forced to go he does not wish to spoil his carriage nor pay for costly repairs simply because fine roads are not for the moment available. The carriage builders have found it practicable to make strong carriages which will ride easily over any of the ordinary American roads. They have not been able to do it by putting in small wheels, however.

A TWO WHEELER.

A DIFFERENCE IN HANDLING.

New York, June 29.

Editor THE AUTOMOBILE:

Dear Sir: Having seen recently some correspondence on the perfections and imperfections of the present types of automobiles, it occurred to me that we are not all David Harums in the automobile line. For instance, one man writes he has had a locomobile and his troubles were without end. He sold it to the first buyer who made an offer for it. The second owner repacked the engine, adjusted the burner and by studying the action of the machine got good speed out of it, made trips of considerable length over the mountains of Pennsylvania, taking the roughest roads and having but one trouble, that of getting water to the boiler fast enough in the mountains, and this he ingeniously overcame, the machine being one of the first turned out.

Another owner finds this part too small, that not as he considers it should be, while another in almost the same town has, I don't believe, ever thought whether any part was made right or wrong, but when he is out he just watches its gait, he enjoys studying its action and it gives him pleasure to note the water gauge, the steam pressure, etc., to see that the whole is working together and the speed is as he wills. When one hears him grow enthusiastic over his machine, it reminds one of the stories we occasionally used to hear from that noted horseman of the city, who is with us no more. But, as I said, we are not all David Harums with the automobile.

Yours,

N. S. O'B.

New Appliances.

ELDRIDGE POCKET VOLTMETER

One of the most practical battery testing instruments, placed upon the market recently, is the Pocket Battery Voltmeter, made by the Eldredge Electric Mfg. Co., of Springfield, Mass. This instrument differs from the ordinary battery gauges, especially, in having a scale, reading in volts, in 1-10 divisions, each instrument being calibrated with a standard voltmeter. It is of quite convenient form, for carrying in the pocket and is thus always at hand when wanted. Being dead-beat, it gives the readings instantly, and can be used in any position. It is intended to test only SINGLE CELLS, of either primary or storage, at a time thus showing which are the poor cells, yet it will cover in range TWO CELLS of primary.

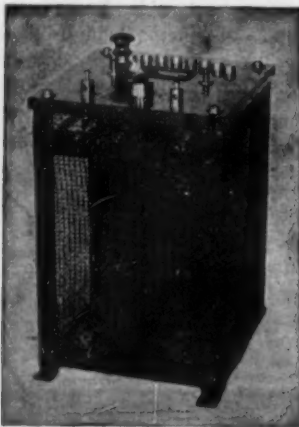


IRON-CLAD PORTABLE RHEOSTAT.

At this season of the year when so many of our readers are taking their summer outings, it is probable that many of them will wish to take an extended tour in their electric automobiles. It has been suggested that the electric automobile does not lend itself as readily for this touring duty as some other types of automobiles, but if one will provide himself with a small, portable rheostat, which will enable him to charge his batteries from any Edison station or any trolley circuit, which, taken together, make an almost complete network of most of our States, even extending into the more rural districts, he will be able to enjoy this pleasure to the utmost.

We illustrate herewith a portable type, manufactured by the Iron-Clad Resistance Co., of Westfield, N. J., and which is particularly applicable for this class of duty, in that it is light, compact and has large capacity. This can be carried in the carriage from place to place and simply connected in circuit when charging the batteries.

The company referred to also make a very complete line of charging rheostats for private stables, also for charging stables, both on a small and on a large scale. They advise us that they



IRON-CLAD PORTABLE RHEOSTAT.

now have going through their works an equipment for one of the largest stations in the country, which will have a nominal full-load capacity of 4,000 amperes, and a maximum overload capacity of 6,000 amperes. This will enable the company for whom this is being made to charge large numbers of batteries in a manner which will insure the life of the positive plates.

THE DE DION-BOUTON MOTORETTE CO. AND ITS VEHICLES.

It is an important item of news to the industry in this country that a company has been formed for actively pushing the De Dion motor in this country. There are in use at the present time, it is said, 20,000 of these motors and they have a world-wide reputation. The De Dion-Bouton Motorette Co., of Brooklyn, N. Y., has purchased from Mr. Skinner his rights to the American agency and has secured large and well-equipped shops for turning out motors and motorettes.

The 2½-horse-power air-cooled motor, of the

This is the type of motor which operates the motorette shown in the above illustration. This motorette has comfortable seating capacity for three persons, and weighs, complete, less than 700 pounds, and will run over normal roads and up moderate grades encountered in actual service at a speed in excess of a horse-drawn vehicle. It is geared to run from five to twenty-five miles per hour.

The De Dion-Bouton Motorette Co. have secured the buildings at Church Lane and 37th street, Brooklyn, within thirty minutes from the Battery and Brooklyn Bridge for their factory and general offices, with plenty of good roads all around to give practical demonstrations of the operation of their motor cycles and motorettes. Manufacturers and intending purchasers of vehicles can do no better than make a personal visit and inspection and take a ride in some of the latest

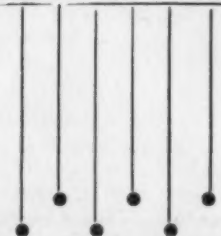
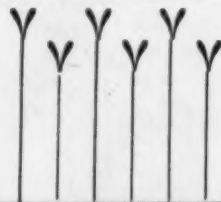


THE DE DION-BOUTON MOTORETTE.

De Dion-Bouton make, which is especially adopted and recommended for motor cycles, tricycles and quadricycles, weighs complete less than sixty pounds. The other two types of motors, which are specially adapted for the light motorettes, are, first, one with an air-cooled cylinder and water-jacketed head of about 3-horse-power capacity, and the other one with a water-jacketed cylinder complete of 3½-horse capacity, weighing about 95 pounds.

types which Mr. Field has just brought back with him from Paris, and which are duplicates of ones which the company will soon be turning out.

The Motorette company proposes to take up energetically the pushing of the motors on the same liberal basis which the parent company abroad is following, of furnishing them to the vehicle and carriage trade for use on vehicles of their manufacture, and assisting such manufacturers with all the technical information and assistance they may desire.



Necessity is the mother of motorcycle invention and the Orient Autogo is father of them all.

ORIENT!

American history tells us that a machine having an Orient name-plate is a superior machine—the acme of cycle perfection.

The casual observer in the streets of Paris will see ten gas driven motorcycles to one carriage having another motive power. This is French progression.

And what does it teach us?

That the combined product of these two great countries is the motor machine for speed, safety, service.

This you may have now—this week. The ORIENT AUTOGO, equipped with either the Aster or De Dion Motors, is ready for immediate delivery. Price, \$900.

Have an illustrated Catalog and get the whole story.

WALTHAM MFG. CO. Waltham, Mass.
U. S. A.

THE CREST SPARKING PLUG.

Unless well constructed, the sparking plug of gasoline motors is liable to give trouble. The intense heat of the engine cylinder soon destroys ordinary insulating materials which, when broken, cause the short-circuiting of the batteries and the consequent stopping of the engine. The Crest Mfg. Co., of Cambridgeport, Mass., reports the successful use of a new insulating material in a sparking plug, the company is now furnishing to the trade.

This plug consists of a shell of steel having a thread at one end that screws in the opening of the cylinder head. A cone of this insulating material fits tightly in the shell making a gas-tight joint without packing. Through this cone a con-



CREST SPARKING PLUG.

ductor passes terminating in a head with a platinum point. Another platinum point on the steel shell makes the second sparking point. The company reports that these plugs have been in use now a considerable time and so far none has failed.

De Dion-Bouton "Motorette" Co.

Church Lane and 37th St.

Brooklyn-New York, N. Y.

Sole Agents and Licensed Manufacturers in United States for

DE-DION BOUTON & CO., PATEAUX, FRANCE

OF

MOTORS AND "MOTORETTES"

TO REACH OUR OFFICES AND FACTORY—Take 5th Ave. Elevated from Brooklyn Bridge and change at 39th St. to Culver Car to Coney Island or—Take 39th St. Ferry from Battery to 39th St. and then take 39th St. Car. Time 30 Minutes either route.

GENERAL
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Special Machinery
Experimental Work
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AUTOMOBILE WORK A SPECIALTY.

HYDRAULIC FORGING IN IRON AND STEEL

The United States Projectile Co., 1st Ave. & Brooklyn, N. Y.



We hereby offer our \$5.00 8-cell Automobile Gasoline Engine Battery at \$4.00 cash, with order. Carriage light 9 cell battery, price \$5.50 for \$4.50 for thirty days, to show you what these cells will do. Our Campaign Button without picture is worth as a portable light, \$3.00; we offer it now at \$1.50, mail prepaid.

WILLIAM ROCHE, Inventor and Sole Manufacturer, 42a Vesey St., New York.



Greatest Hill Climbers ever produced as shown by tests in the Alleghany Mountains



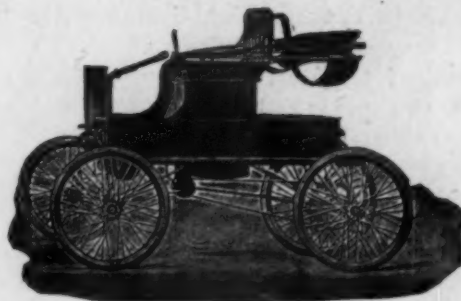
No Visible Exhaust

Simple, Reliable

BALDWIN (STEAM) AUTOMOBILE

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Unique in Construction. Most Pleasing in Tone. Easily Attached to Any Vehicle. Insist on Having the Right Thing.

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Conditions found in Steam and
Gasoline Carriages

Cylinders are small
High Piston speed.
High temperature in cylinders

They need

An Oil of high fire test
An Oil that will retain its viscosity at high temperature
An Oil that will not decompose with heat
An Oil free from acid

Sold in
any
Quantity

"Locobile" will do the work under these conditions

G. E. HALL, 211 Centre Street, New York

UPTON TRANSMISSION GEAR

For Steam, Gasolene or
Electric Motor Vehicles

ABSOLUTELY DUST PROOF

Lightest, Simplest, Safest, most complete Gear on the market

The Upton Transmission Gear has advantages which no other possesses.
It is Compact, Neat and Strong.

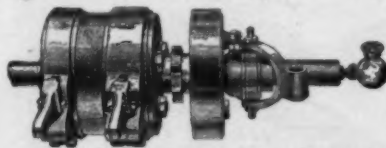
It is Absolutely Dust Proof.

It has two speeds and a reverse.

Its speed ratio may be arranged at will.

It has an Automatic Oiling Device.

It may be readily adapted to any motor carriage. It is unquestionably the most perfect gear in existence.



Two sizes: No. 1, 4 to 5 HP., 35 lbs. No. 2, 7 to 8 HP., 43 lbs.

Orders promptly filled. Write for circulars and prices to

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Please mention THE AUTOMOBILE when writing to advertisers.

Patents.

List of Automobile patents granted during month of June.

- 648,537—Vehicle Tire. Issued to J. G. Sorup.
648,464—Means for Inflating Pneumatic Tires. Issued to G. W. Mowry.
648,391—Vehicle Wheel. Issued to N. Coleman.
648,385—Vehicle Wheel. Issued to D. K. Davol.
648,408—Self-Pumping Pneumatic Vehicle Wheel. Issued to W. Hays.
649,003—Storage Battery Envelope. Issued to E. A. Sperry.
649,252—Carbureter. Issued to A. F. Morey.
649,324—Carbureter for Explosive Engine. Issued to V. L. Longuemare.
649,191—Carbureter for Gasoline Engines. Issued to G. Alderson.
649,100—Traction Engine. Issued to W. R. Renshaw.
649,053—Pneumatic Tire. Issued to W. F. Henderson.
649,016—Elastic Tire. Issued to L. Thurns.
649,277—Valve for Explosive Engine. Issued to De Dion & Bouton.
648,914—Vaporizer for Petroleum Motors. Issued to H. A. Bertheau.
649,291—Vehicle Body Hanger. Issued to J. J. Fetzer.
649,009—Vehicle Wheel. Issued to M. Bruner.
649,117—Vehicle Wheel. Issued to W. H. Strutt.
649,435—Carbureter. Issued to Carter & Zierlein.
649,865—Carbureter. Issued to Verhagen & Van Gink.
649,689—Motor Carriage. Issued to R. M. Ray.
649,667—Motor Carriage. Issued to W. B. Mason.
649,778—Electric Igniter for Gas Engines. Issued to D. M. Tuttle.
649,441—Sparkign Igniter for Explosive Engines. Issued to C. E. Duryea.
649,713—Explosive Engine. Issued to Woodward & Barckdall.
649,719, 649,720—Vehicle Tire. Issued to C. E. Duryea.
649,775—Vehicle Wheel Tire. Issued to J. M. Sweet.
649,500—Vehicle Body Hanger. Issued to L. Burg.
649,807—Vehicle Running Gear. Issued to T. Byrd.
32,661—Design for Driving Axle for Motor Vehicles. Issued to Morgan & Heaslet.
32,662—Design for Axle Frame for Motor Vehicles. Issued to Morgan & Heaslet.
650,893—Automobile. Issued to L. S. Buffington.
650,837—Balance Gearing for Automobiles. Issued to H. E. Heath.
650,847—Automobile Delivery Wagon. Issued to H. W. Libby.
650,838, 650,839, 650,840—Steering Mechanism for Automobiles. Issued to H. E. Heath.
651,225—Axle and Box for Vehicle. Issued to J. C. Anderson.
651,017—Carbureter. Issued to A. L. Navone.
651,296—Speed Gearing. Issued to G. H. B. Canoles.
651,035—Rubber Tired Wheel. Issued to W. D. Gregory.
650,885—Storage Battery, etc. Issued to S. L. Wiegand.
651,281—Vehicle Body. Issued to H. McLaughlin.
650,816—Motor Vehicle. Issued to C. E. Belcher.
651,323—Motor Vehicle. Issued to T. B. Dooley.
650,950—Automobile. Issued to L. W. Ravenes.
651,041—Vehicle Wheel. Issued to W. J. Johnston.
650,276—Carbureter. Issued to G. B. Robinson.
650,014—Electric Motor Cycle. Issued to I. Kitsee.
651,471—Secondary Battery Electrode. Issued to P. F. Ribbe.
651,476—Storage Battery. Issued to O. T. Bugg, Jr.

New Books.

LEE'S AMERICAN AUTOMOBILE ANNUAL FOR 1900. Edited by Alfred B. Chambers, Ph.D. Chicago: Laird & Lee. Illustrated; 275 pages; 6½ x 4½; flexible leather. Price, \$1.50.

A hand-book for all interested in the automobile, presenting the various features of the different kinds of motor carriages in an instructive manner. A brief chapter on the history of the automobile forms the introduction. The internal-combustion motor is first treated, and several motors and carriages are illustrated. The tendency to give much attention to the foreign types to the exclusion of that which is American is noticeable; also that of using the launch type of motor for the explanation of automobile practice, which is in many respects different. One steam automobile is described with mention only of two or three others. The electric vehicle receives more general attention, directions are given for the care and charging of the storage batteries. There is an interesting chapter on the steering of automobiles, and wheels, tires, running gears, etc., are briefly touched upon.

GAS ENGINE CONSTRUCTION. By Henry V. A. Parsell, Jr., and Arthur J. Weed, M. E. New York, 1900. Norman W. Henley & Co. Large 8vo; illustrated; 300 pages. Price, \$2.50.

A practical treatise describing the theory and principles of the action of gas engines of various types and the design and construction of a half-horse power gas engine. It deals with the practical side, more especially for the amateur mechanic. The illustrations are all original and

made especially for this book. It is without question the best book of the kind that has so far appeared. The descriptions of the various kinds of gas engines are accompanied by illustrations, and in the instructions for the construction of gas engines, every detail is minutely described, from the making of the patterns to the last connection necessary to complete the engine. The tools necessary to make the engine are also considered, and the lathe work is illustrated by cuts from photographs that show the method of fixing in lathe and applying the tools. The book will also be found of interest by all engaged in the construction of gas engines. So clearly is the subject presented that anyone with the least skill in using tools can construct the engine for which the dimensions are given.

LOGARITHMIC TABLES. By Prof. George Wm. Jones, of Cornell University. 1900. Utica, N. Y.: George W. Jones. Cloth; 100 pages. \$1.

For the engineer and student this is an admirably arranged set of tables. Its size, $6\frac{1}{2} \times 10$, makes it more particularly adapted for office or laboratory use. The tables, which include logarithms, trigonometric functions, sines and tangents, squares, cubes, roots, weights and measures, etc., are so arranged as to afford ready reference. The type is good size, another excellent feature.

Trade Notes.

The Wells-Meeker Motor Vehicle Co. has been recently incorporated under the laws of Ohio.

The Kensington Automobile Mfg. Co. filed articles of incorporation at Albany, N. Y., last month with a capital of \$600,000.

The Waltham Mfg. Co., of Waltham, Mass., has recently sent out a neat circular, pointing out the superior qualities of the Orient "autogo."

The Milwaukee Automobile Co. has been making deliveries of automobiles for some time and can assure its customers of prompt deliveries in the future.

A catalogue, just pocket size, 4x8, describes the several styles of locomobiles now on the market. It is printed in three colors and is very attractively gotten up. The questions often asked are answered within its pages. It is not a book, however, of questions and answers, but a very concise description of this form of motor vehicle, and statement of what is will do under various circumstances.

Phineas Jones & Son, Newark, N. J., report this an unusually busy season of the year. This well-known firm make a specialty of wood wheels for automobiles, and on a recent visit a representative of THE AUTOMOBILE was shown through the factory, where wheels were in all stages of manufacture. Among the leading automobile manufacturers, wheels were under construction for the Riker Motor Vehicle Co., the American Electric Vehicle Co., the Automobile Co. of America, and others. A good wheel is a very important part of a vehicle and this firm aims to turn out the very best that can be produced.

The Baldwin Automobile Mfg. Co. is the new name of the company formerly the Staymaker-Barry Co., of South Connelville, Pa. It is reported that a reorganization occurred at a meeting of the stockholders last month, and that Mr. Staymaker withdraws, buying from the company its property at Lancaster. Deliveries of automobiles will be made this month. The company has made a large increase in its working force and the building of automobiles of the Baldwin type is progressing rapidly.

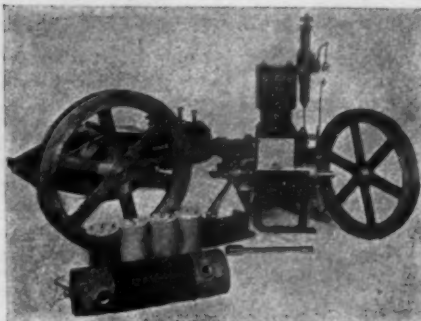
An important change last month in St. Louis was the consolidation of the Automobile Supply Co. and the St. Louis Electric Automobile Co. under the name of the St. Louis Automobile & Supply Co. This new company is capitalized at \$10,000, and the officers are: President, B. C. Keller; Treasurer, Peter A. O'Neal; Manager, F. E. Bush. The company has a factory at the corner of 23d and Locust Sts., and the business that has been rapidly built up in the automobile supply line will be continued. The Automobile Supply Co. was the first company to devote itself exclusively to automobile supplies, and it has become well known in the trade. It was one year old at the time of the consolidation, and the prestige it had gained will accrue to its successor.

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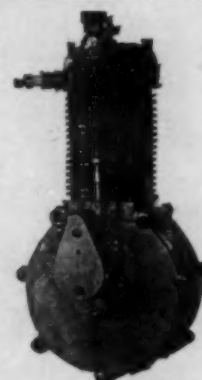
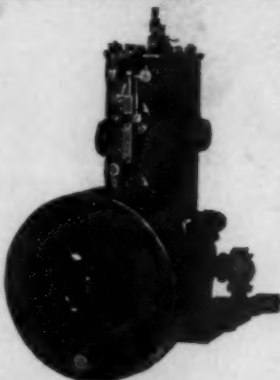
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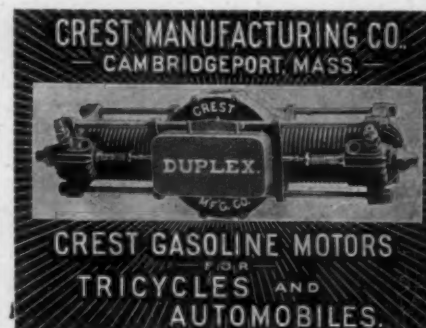
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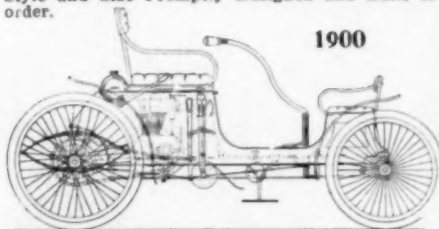


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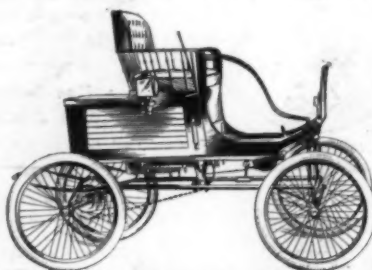
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